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every object revealed to us by our telescopes; or it may be that the single and multiple stars and the star-clusters of our galaxy, together with the irregular and the planetary nebulae form but an "island universe," and that in the spiral nebulae we have the visible evidence of the existence of hundreds of thousands of other galaxies perhaps as large and rich and diversified as our own and all of them units in a system of a still higher order.

PLANETARY PHENOMENA FOR NOVEMBER AND DECEMBER, 1921

By Malcolm McNeill

PHASES OF THE MOON, PACIFIC TIME

First Quarter....	Nov. 7, 7^h54^m A.M.	First Quarter...	Dec. 7, 5^h20^m A.M.
Full Moon.......	" 15, 5 39 A.M.	Full Moon......	" 14, 6 51 P.M.
Last Quarter.....	" 22, 3 41 A.M.	Last Quarter....	" 21, 11 54 A.M.
New Moon......	" 29, 5 26 A.M.	New Moon.....	" 28, 9 39 P.M.

The Sun reaches the winter solstice, its farthest southern position, and begins its northern journey on December 22, 1^h8^m A. M., Pacific Time.

Mercury passed inferior conjunction with the Sun on October 31, becoming a morning star. It remains a morning star until it reaches superior conjunction on December 27. It reaches greatest west elongation, 19°27′, on November 16, rising on that date somewhat more than an hour and a half before sunrise. The interval will be more than an hour from a few days before November 16 until after December 1, and the planet can be seen in the early morning twilight under good weather conditions thru-out this period. The elongation is rather small as it occurs only ten days after the planet passes its perihelion, and the duration of naked eye visibility is somewhat less than is usual for greatest west elongations occurring at this season.

Venus remains a morning star rising about two hours before sunrise on November 1, but this interval shortens up to only a little more than half an hour by December 31. The planet's motion among the stars is quite rapid, 75° eastward and 19° southward among the stars, from *Virgo* thru *Libra* and *Scorpio* into *Sagittarius*. On November 6 it passes about 4° north of *Spica*, *α Virginis*, and on December 13 about 6° north of *Antares*, *α Scorpii*. Altho *Venus* is now on the far side of its orbit from the Earth and drawing near its maximum distance it remains far more brilliant than any other planet and it can probably be seen by the naked eye in the early morning twilight up to the end of December.

Mars rises at about 3 A. M. on November 1, and at a little after 2 A. M. on December 31, so that it has become an easy object for early morning observation. During the two months it moves from the eastern part of *Leo* to the eastern part of *Virgo* 34° eastward and 14° southward. The Sun's eastward motion is about double this, so that the planet's apparent distance from the Sun increases about 30° during the two months. On December 11 *Mars* passes nearly 4° north of *Spica, a Virginis.* On November 13 it is in conjunction with *Saturn*, the nearest approach being less than 1°, and on November 26 it is in very close conjunction with *Jupiter*, the nearest approach being only 10′, *Mars* passing north of *Jupiter. Mars* reaches its greatest distance in miles from the Sun on November 3, 157 millions. This is 28 millions more than it was at the beginning of the year. The distance of the planet from the Earth diminishes very rapidly from 211 millions on November 1 to 165 millions on December 31. Early in December it is about twice as far from the Earth as the Earth is from the Sun. On account of the diminution of distance the planet is brightening perceptibly, being at the end of December about the same as it was during February, and nearly twice as bright as it was at the time of conjunction with the Sun. The planet is now on its way toward opposition with the Sun and will reach it June 10, 1922. This will be a much more favorable one than the last, but not nearly as good as the next one. This is to occur August 23, 1924, *Mars* then being less than 35 millions of miles from the Earth, the nearest approach for a great many years.

Jupiter rises shortly before 4 A. M. on November 1 and shortly before 1 A. M. on December 31. It is in the constellation *Virgo* and moves about 6° east and 3° south during the two months. At the end of December it is about 4° west and 5° north of *Spica, a Virginis.*

Saturn is in the same neighborhood as *Jupiter*, rising from half an hour to an hour earlier. It is also in the constellation *Virgo* and like *Jupiter* is moving eastward and southward, but at a much smaller rate. On November 1 *Jupiter* is 4° east and 3° south of *Saturn*, these distances increasing by December 31 to 8° and 5°

respectively. As seen in the telescope the rings have widened perceptibly, so that the ratio of minor to major axis is about 0.09.

Uranus is in the southwestern sky in the evening. It does not set until 1^h15^m A. M. on November 1, and on December 31 it remains above the horizon until nearly 9:30 P. M. It remains in *Aquarius* moving slowly westward until about the middle of November. It then begins its eastward motion, and will, up to December 31, move nearly 1° in that direction. It remains in the neighborhood of the fourth magnitude star λ *Aquarii*, being at the end of December less than 4° west and 2° south of the star, the planet moving slowly toward the star.

Neptune is in the eastern and southeastern quarter of the sky in the evening moving very slowly westward in the constellation *Cancer*.

LECTURES IN ASTRONOMY

San Francisco is noted for its public spirited citizens, and the Astronomical Society of the Pacific is fortunate enough to number many of them among its members and friends. One of these citizens provided the funds for the course of popular lectures in Astronomy which was given in San Francisco under the auspices of this Society in the season 1920-1921.

It is a pleasure to repeat here the announcement made at the Annual Meeting of the Society in January, 1921, that another one of them has made provision for a similar course for the present season. The donors of these two funds and other members of the Society are engaged in securing additional donations to the end that a permanent foundation for such lecture courses may be established. One such donation has already been made and others are in prospect despite the trying financial conditions of the times.

The first lecture of the present course will be given in Native Sons Hall, San Francisco, at 8 o'clock in the evening of Friday, October 14, 1921, by Mr. Ferdinand Ellerman, Astronomer in the Mount Wilson Observatory, Pasadena, on "The Sun."

The second lecture will be given at the same place and hour on Friday evening, November 11, 1921. The speaker will be Dr. J. S. Plaskett, Director of the Dominion Astrophysical Observatory, Victoria, B. C., who will take for his subject "The Dimensions of the Stars." Both of these lectures will be illustrated by lantern